

# Key

## 5.4 Ellipses

Name \_\_\_\_\_ Date \_\_\_\_\_ Period \_\_\_\_\_

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

Find the center, vertices, and foci of the ellipse with the given equation.

1)  $\frac{x^2}{16} + \frac{y^2}{7} = 1$

Center:  $(0, 0)$

vert.:  $(4, 0), (-4, 0)$

foci:  $(3, 0), (-3, 0)$

1) \_\_\_\_\_

2)  $\frac{y^2}{36} + \frac{x^2}{27} = 1$

Center:  $(0, 0)$

vert.:  $(0, 6), (0, -6)$

foci:  $(0, 3), (0, -3)$

2) \_\_\_\_\_

3)  $\frac{9x^2}{36} + \frac{4y^2}{36} = \frac{36}{36}$

$\frac{x^2}{4} + \frac{y^2}{9} = 1$

Center:  $(0, 0)$

vert.:  $(0, 3), (0, -3)$

foci:  $(0, \sqrt{5}), (0, -\sqrt{5})$

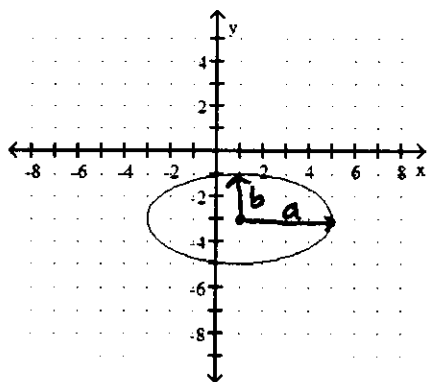
3) \_\_\_\_\_

**MULTIPLE CHOICE.** Choose the one alternative that best completes the statement or answers the question.

Match the given graph with its equation.

4)

4) D



center  $(1, -3)$

$a = 4$

$b = 2$

A)  $\frac{(x+1)^2}{16} + \frac{(y-3)^2}{4} = 1$

B)  $\frac{(x+1)^2}{4} + \frac{(y-3)^2}{16} = 1$

C)  $\frac{(x-1)^2}{4} + \frac{(y+3)^2}{16} = 1$

D)  $\frac{(x-1)^2}{16} + \frac{(y+3)^2}{4} = 1$

**SHORT ANSWER.** Write the word or phrase that best completes each statement or answers the question.

Sketch the graph of the ellipse by hand.

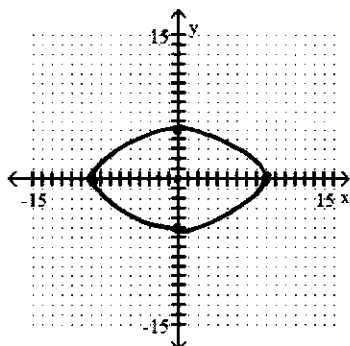
5)  $\frac{x^2}{81} + \frac{y^2}{25} = 1$

Center (0,0)

$a = 9$

$b = 5$

5) \_\_\_\_\_



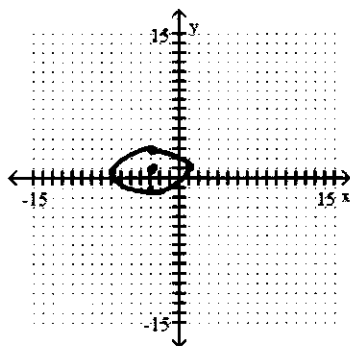
6)  $\frac{(x+3)^2}{16} + \frac{(y-1)^2}{4} = 1$

Center (-3,1)

$a = 4$

$b = 2$

6) \_\_\_\_\_



Graph the ellipse using your calculator. (Remember to solve for y.)

7)  $\frac{y^2}{64} + \frac{x^2}{16} = 1$

Center (0,0)

$a = 8$   $b = 4$

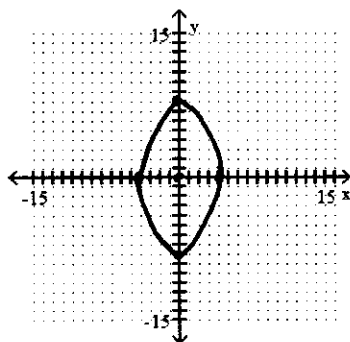
$64\left(\frac{y^2}{64} + \frac{x^2}{16} = 1\right)$

$y^2 + 4x^2 = 64$

$y^2 = 64 - 4x^2$

$y = \pm \sqrt{64 - 4x^2}$

7) \_\_\_\_\_



Find an equation in standard form for the ellipse that satisfies the given conditions.

8) Minor axis length 4, major axis length 6 on y-axis

$b = 2$

$a = 3$

8) \_\_\_\_\_

$$\boxed{\frac{x^2}{4} + \frac{y^2}{9} = 1}$$

- 9) Major axis length 10, and foci at  $(0, \pm 3)$

$$a = 5$$

$$c = 3$$

$$\text{center}(0,0) \quad a^2 - b^2 = c^2$$

$$\boxed{\frac{y^2}{25} + \frac{x^2}{16} = 1}$$

$$25 - b^2 = 9 \\ b = 4$$

9) \_\_\_\_\_

- 10) Major axis endpoints  $(0, \pm 6)$ , minor axis length 8

$$a = 6$$

$$\text{center}(0,0)$$

$$b = 4$$

$$\boxed{\frac{y^2}{36} + \frac{x^2}{16} = 1}$$

10) \_\_\_\_\_

- 11) Minor axis endpoints  $(\pm 12, 0)$ , major axis length 26

$$b = 12$$

$$a = 13$$

$$\text{center}(0,0)$$

$$\boxed{\frac{y^2}{144} + \frac{x^2}{169} = 1}$$

11) \_\_\_\_\_

- 12) An ellipse with foci at  $(1, -4)$  and  $(5, -4)$ ; major axis endpoints are  $(0, -4)$  and  $(6, -4)$

$$\text{center}(3, -4)$$

$$c = 2$$

$$a = 3$$

$$\boxed{\frac{(x-3)^2}{9} + \frac{(y+4)^2}{5} = 1}$$

$$9 - b^2 = 4 \\ b^2 = 5$$

12) \_\_\_\_\_

- 13) An ellipse with major axis from  $(-5, 2)$  to  $(3, 2)$ ; minor axis length 6

$$\text{center}(-1, 2)$$

$$b = 3$$

$$\boxed{\frac{(x+1)^2}{16} + \frac{(y-2)^2}{9} = 1}$$

$$a = 4$$

13) \_\_\_\_\_

Find the center, vertices, and foci of the ellipse with the given equation.

14)  $\frac{(x-7)^2}{64} + \frac{(y+3)^2}{81} = 1$

$$\text{Center: } (7, -3)$$

$$\text{vert: } (7, 6)(7, -12)$$

$$\text{foci: } (7, -3 \pm \sqrt{17})$$

14) \_\_\_\_\_

Find the eccentricity of the ellipse.

15)  $\frac{35x^2}{35} + \frac{y^2}{35} = \frac{35}{35}$

$$e = \frac{c}{a}$$

$$\rightarrow \frac{\sqrt{34}}{\sqrt{35}}$$

$$= \boxed{.9856}$$

$$35 - 1 = c^2 \\ 34 = c^2 \\ \sqrt{34} = c$$

15) \_\_\_\_\_

- 16) Prove that the graph of the equation is an ellipse and finds its vertices, foci and eccentricity.

$$9x^2 + 4y^2 - 18x + 8y - 23 = 0$$

$$9x^2 - 18x + 4y^2 + 8y = 23$$

$$9(x^2 - 2x + \underline{\quad}) + 4(y^2 + 2y + \underline{\quad}) = 23 + 9 + 4$$

$$\frac{9(x-1)^2}{36} + \frac{4(y+1)^2}{36} = \frac{36}{36}$$

$$\frac{(x-1)^2}{4} + \frac{(y+1)^2}{9} = 1 \quad \checkmark$$

$$\text{center: } (1, -1)$$

$$\text{vert: } (1, -4)(1, 2)$$

$$\text{foci: } (1, -1 \pm \sqrt{5})$$

$$\text{eccentricity} = \frac{\sqrt{5}}{3} \approx .745$$

16) \_\_\_\_\_